simple consideration of the energy relations involved. If the law were true, all reactions which give oxygen at ordinary temperatures should give it in the form of ozone. The fact that some such reactions give ordinary oxygen while others give ozone is doubtless connected, in some cases, at least, with the structure of the reacting compounds as well as with their inherent energy. And no one has thus far told us how a satisfactory account of matters connected with chemical structure can be given without the aid of the atomic theory.

One hesitates to criticize a book of such surpassing excellence and one destined to be so very useful. But those very qualities which have made Professor Ostwald so much beloved by all of his acquaintances and which have given him such an extraordinary hold on his students, seem to lead some of them to accept almost without question everything which he writes and it seems right that a divergent view should sometimes find expression.

WILLIAM A. NOYES.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for February contains articles on 'The Unity of the Gnathostome Type,' by Howard Ayers; 'Old Age in Brachiopoda—a Preliminary Study,' by H. W. Shimer; and 'The Habits of *Necturus maculosus*,' by A. C. Eycleshymer. Dr. Ayers concludes that the Marsipobranchs are true Gnathostomata and that the only living Acraniate is Amphioxus. Dr. Shimer's article gives a summary of the principal characters that accompany old age in the brachiopods and includes many illustrations of typical examples besides presenting suggestions as to their origin and meaning. Professor Eycleshymer discusses the habits of *Necturus* at some length, giving much new and interesting information in regard to its nests and breeding habits. We quite agree with him that any specimen over a foot in length is unusually large.

The University Bulletin, University of Michigan, for December, 1905, contains the report of the curator of the museum. Mr. Adams is to be complimented upon having accomplished much with a small expenditure of money and on having done much by collecting, and rearranging and labeling the museum collections, to promote its efficiency. The chief accessions were 131 skins of mammals, representing 23 species, and 298 birds of 111 species.

Colorado College Publications, Science Series, No. 46, is devoted to an annotated list of 'The Mammals of Colorado,' by E. R. Warren. This contains a very considerable amount of information compressed into a few pages and is accompanied by a bibliography.

The Quarterly Record of Additions to the Museum of Hull, England, is an excellent device for economical and extensive publication. Objects of interest are described in the *Eastern Morning News,* electrotypes made of the articles, and each quarter these are combined and issued in pamphlet form as one of the museum publications.

SOCIETIES AND ACADEMIES.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 412th regular meeting was held on February 17, 1906, with Vice-president Palmer in the chair and thirty-two persons present.

Professor Paul Bartsch presented a paper on 'Variation in the Shell of *Goniobasis virginica,* with an Outline for Breeding Experiments.' He described and illustrated with lantern slides the wide differences among individuals of this species. Collections from the vicinity of Mount Vernon in tidewater subject to an occasional slight salinity are constant in form. Those from the Shenandoah at Harpers Ferry likewise show little variation, though plainly recognizable from the Mount Vernon representatives of the species. About Washington the shells show extreme variation. Intergrades everywhere exist and the subspecific groups all run together. Without attempting to account for these variations, experiments were proposed calculated to throw light on the subject. These consisted substantially in transplanting the local forms and studying their progeny under the new conditions. In the Shenan-

doah at Harpers Ferry are to be held, in a series of screened troughs, a few thousand specimens of the Mount Vernon form, in another series a mixture of equal numbers of Mount Vernon and Harpers Ferry specimens, a third series to be empty as a check upon the results. At Mount Vernon or at the southern limit of the range of the species, and at Washington, these series are to be repeated. Such trials would be expected to yield interesting and valuable, even if negative, results.

Under the title 'The Nature of Evolutionary Motion' Mr. O. F. Cook gave an exposition of his kinetic theory, and showed how the interpretation of evolutionary factors differs from that of other doctrines. It was held, in particular, that isolation and natural selection are not at all factors of evolution in any strict and scientific sense; they conduce to the differentiation of new species (speciation), and to increased fitness (adaptation), but have no power to actuate the process of organic change in species (evolution). The principal agent of evolutionary progress is the normal interbreeding of the normally diverse individuals of which species are composed. Evolution is thus an intraspecific phenomenon, instead of being interspecific. The intraspecific differences which contribute most to evolutionary motion are not those which arise as adjustments to different conditions of the environment (artism), but those which are independent of environmental adjustments (heterism).

Outlines and diagrams were shown in explaining the bearing of these distinctions upon the four principal types of evolutionary theories, static, saltatory, determinant and kinetic. Static theories were defined as those which view the species as normally stationary, though moved occasionally by environmental causes. Saltatory theories prescribe motion of an intermittent character and at remote intervals. Naegeli's determinant theory held that species move in a single definite direction as a result of causes inherent in the organisms. The kinetic theory provides for an indeterminate, composite motion resulting from the continuous interbreeding of the diverse individuals of the species. Selection does not cause this motion, but can restrict and deflect it, and can thus lead evolution in adaptive directions. Saltatory and determinant theories do not provide for any practical adaptive influence on evolution. Although completely denying the current assumption that selection is the cause or active principle of evolution, the kinetic theory provides better than any other for a practical explanation of the manner in which selection induces adaptation.

The 413th meeting was held March 3, 1906, President Knowlton in the chair and thirty-two persons present. Dr. L. O. Howard presented the first paper on 'The Gypsy Moth and the Brown-tailed Moth and the Introduction of their European Parasites,' illustrated with lantern slides. He described the accidental introduction of the gypsy moth into Massachusetts by the escape of an egg mass from some breeding experiments in 1868. In 1900 after spending a million dollars in fighting the insect the state stopped the work and the moth gained ground until last year when the state appropriated $300,000 to be spent during three years. $10,000 was also appropriated for the introduction of its parasites and one half this sum was turned over to Dr. Howard for the furtherance of this object. He has imported from Sardinia 2,500 of the parasite-infested larvæ. The moth has American parasites, but the percentage of infected larvæ is lower, and the tree infection much greater in America than in Europe. The illustrations showed graphically the entire defoliation of trees caused by the caterpillars and the large scale in which the campaign against them is conducted,—by banding trees, creosoting the egg masses and burning over underbrush with the blast torch.

The brown-tailed moth was brought over in the winter cocoon stage, a nest of leaves bound together and containing larvæ. Unlike the gypsy moth the adult is a good flier and, therefore, disseminates more directly and rapidly and its spread is a foregone conclusion.

Professor A. S. Hitchcock read a paper entitled 'A Synopsis of the Genus Tripsacum.'

Tripsacum is a genus of grasses extending from the southern United States to South

America. The common species, *T. dactyloides* (L.) Willd., is found from southern New England along the coast to Mexico, and in the interior as far north as Iowa and Nebraska. A subspecies occurs in Mexico (*T. dactyloides hispidum* Hitchcock). Two other species occur in the United States, *T. floridanum*, confined to the vicinity of Miami, Florida, and *T. lemmeni* confined to southern Arizona and northern Mexico. Four additional species inhabit Mexico and Central America, *T. fasciculatum, T. lanceolatum, T. pilosum* and a new species, *T. latifolium*. In order to show the relationship of this new species to the others of this genus the whole group was worked over. The paper consisted of a key to species followed by descriptions, citation of specimens and critical notes. The genus was divided into two sections. The staminate spikelets are in pairs at each joint of the spike. In section I. these spikelets are both sessile (*T. dactyloides* and its allies). In section II. one of the spikelets of each pair is pedicelled (*T. fasciculatum* and its allies).

M. C. MARSH,
Recording Secretary.

THE NEW YORK ACADEMY OF SCIENCES. SECTION OF GEOLOGY AND MINERALOGY.

Meeting of January 8, 1906.—Vice-President Hovey in the chair. The following papers were read:

Geological Notes on the Western Sierra Madre of Chihuahua, Mexico: Dr. EDMUND OTIS HOVEY.

The paper gave a concise résumé with the aid of lantern slides, of observations made by the author upon an expedition made for the American Museum of Natural History in February, March and April, 1905. The route lay southwestward and southward from Ciudad Juarez to Ocampo, thence to the railroad again at Miñaca. The development of bolson deserts in arid regions and the similar bolson basins in the less arid regions was described. These bolsons have normally no external drainage, but in many cases they have been invaded by streams from without. The Aros River has cut through several such enclosed basins, as is shown by the remains of local conglomerates and sandstones. The section exposed in the deep canyon of the Aros shows that a foundation of Cretaceous (?) limestone has been covered by old andesitic eruptives; that continental movements have raised, tilted, faulted and metamorphosed the limestone, producing schists from clayey beds; that granite has been intruded under and into the limestone; that later and more acid lavas and tuffs (dacites and rhyolites) have been poured out or deposited over the region; that the latest outflows were of basaltic lavas; that the local conglomerates and sandstones have been formed in constructional basins by the disintegration of the mountain slopes. Many other points of geologic interest were brought out in the photographs.

Discovery of the Schoharie Fauna in Michigan: A. W. GRABAU.

Recent examination of the limestones of the Mackinaw region for the Michigan Geologic Survey showed the existence of the Schoharie fauna in the basal portion of the Dundee formation, in a number of localities in the northern part of lower Michigan; notably at Mill Creek, near Mackinaw City, and on Mackinaw Island. Such typical species as *Trochoceras clio, Atrypa impressa, Rhipidomella alsa, Conocardeum cuneus, Phacops cristatus,* etc., characterize this fauna. The strata containing it rest directly upon beds with *Leperditia cf. scalaris,* and, therefore, of lower Manlius (Greenfield limestone or Cobleskill) age, from which they are separated by a pronounced disconformity. The finding of this fauna fixes the date of the great mid-Devonic transgression.

Preliminary Note on Sporadic Occurrence of Diamonds in North America: GEORGE F. KUNZ.

Dr. Kunz pointed out the general features of the occurrence of diamonds in North America, reserving the more complete discussion for the next meeting.

A. W. GRABAU,
Secretary.

COLUMBIA UNIVERSITY.

THE TORREY BOTANICAL CLUB.

THE meeting of February 13 was called to order at the American Museum of Natural History by the secretary, at 8:30 o'clock. Owing to the absence of the president, Dr. N. L. Britton was called to the chair. Twenty-three persons were present.

A paper by Dr. Arthur Edwards, on the 'Origin of the Bacillaria,' was read by its title and referred to the board of editors with power.

The paper of the evening was an illustrated lecture by Mr. George V. Nash, on the 'General Botanical Features of Orchids.'

There seems to be a general misconception among many as to just what an orchid is. Any plant which grows on a tree, or has some peculiar feature is, without hesitation, called an orchid. This mistake is frequently made in regard to the pitcher plants, *Nepenthes,* or to the tail-flowers, *Anthurium.* In order more clearly to define the structure of the orchid flower, a large flower of the genus *Cattleya* was illustrated on the screen. The uniting in one organ, called the *column,* of the stamens and pistils, serves at once to distinguish this family from all related ones. The diandrous and monandrous forms of this column were described and illustrated with lantern slides, as were the other features of the family. The two kinds of pollinia were explained, that which develops appendages at the base, and that which is without appendages, or develops them at the apex, the former associated with the persistent anthers, the latter with the deciduous anthers. Attention was called to the thickened stems of most orchids. In some the stem is very short and much enlarged. Such stems are known as *pseudobulbs. Oncidium* and *Odontoglossum* are examples of this sort. In others the entire stem is thickened, as is the case in *Cattleya* and *Dendrobium.* The lateral and terminal forms of inflorescence were described, the former arising from the base of the pseudobulb, the latter from its apex. The venation of the leaves, whether convolute or conduplicate, was illustrated. The manner of growth, whether limited or unlimited, was indicated; the limited in such genera as *Epidendron, Oncidium, Odontoglossum, Masdevallia* and in fact the greater part of the orchids; the other, the unlimited, in such genera as *Vanilla,* and *Angræcum,* in which the axis ascends continuously.

The latest comprehensive treatment of this interesting family is by Pfitzer, in Engler and Prantl's 'Natürlichen Pflanzenfamilien.' In his classification he utilized the characters and habits of growth referred to above.

The orchid family is a large one, embracing some 6,000 or 7,000 species, mostly distributed in tropical regions. Comparatively few are found in the warm temperate, and almost none in the cold portions of the temperate zone. The center of their distribution in the old world is in India and the Malay region. Such genera as *Dendrobium, Vanda* and *Bulbophyllum* represent these. In the new world they are found in the greatest numbers in Brazil and northern South America. Such genera as *Cattleya, Lælia* and *Masdevallia* illustrate these. In the United States there are about 150 species, representing 44 genera. These are mainly terrestrial, the comparatively few epiphytes being confined to Florida and the gulf states.

By far the greater part of the orchids grow in hot humid regions, where they are found almost exclusively growing on trees, or epiphytic. The terrestrial species in the tropics are relatively few. The epiphytes usually have thick fleshy leaves, and these and their thick stems serve as storage organs, for their water supply is precarious. While it is true that most orchids like humid conditions, this is not always the case. During an exploration of the Inaguas, which are extremely xerophytic, great masses of epidendrons were found growing on the bases of the small shrubs or trees, or on the hot limestone rock; and to emphasize this desert condition, was a species of *Agave* growing among them. They seemed to flourish, for the pseudobulbs were strong and vigorous.

Nearly all tropical orchids are epiphytic, while in temperate regions they are terrestrial, the soil around their roots protecting them from the extreme cold of winter. As a rule terrestrial orchids have thin leaves, for their

water supply is not so limited as is the case with epiphytic orchids.

In distribution orchids are very local. Few genera are common to both the old world and the new, and when they are common to both, the distribution is a zonal one. The genus *Cypripedium,* as at one time understood, was a supposed exception to this. Recent authors, however, basing their conclusions upon well-defined structural differences in the flowers, have divided this, at one time cosmopolitan, genus, into four genera, each of the four genera with a well-defined geographical distribution. We have now, instead of the one big genus, the following:

Selinepedium, new world, with 3 species, known only from Central America to Brazil.

Cypripedium, old world and new, but zonal in distribution, with 28 species, north temperate.

Phragmipedium, old world, with 11 species, tropical America only.

Paphiopedilum, old world, with 46 species, tropical Asia, Malaya, Philippines, etc.

As genera typical of a zonal distribution, there were mentioned: *Cypripedium, Pogonia* and *Limodorum.* Among the genera peculiar to the new world are: *Masdevallia, Pleurothallis, Epidendron, Cattleya, Lælia, Lycaste, Maxillaria, Odontoglossum, Miltonia, Oncidium* and *Dichæa.*

Among those confined to the old world are: *Thunia, Cœlogyne, Pleione, Ansellia, Phagus, Dendrobium, Eria, Bulbophyllum, Cymbidium, Phalænopsis, Vanda, Angræcum* and *Ærides.*

The different features were illustrated with lantern slides, many of them colored. The latter were the work of Mrs. Van Brunt, and were kindly loaned for the occasion by her.

Alluding to Mr. Nash's discussion of the satisfactory breaking up of the old genus *Cypripedium* into four genera, and the restriction of *Cypripedium* to its type species and immediate relatives, having a well defined zonal distribution, Dr. Britton remarked upon the wide application of this principle in the progressive study of plants and animals, causing the recognition of very many more genera than were believed to exist by most botanical and zoological students in the last century.

The vastly greater number of species now known, and their more critical comparative study in the field and in collections, as well as the more exact understanding of long-recognized species, show that the number of homogeneous groups which we call genera, existing in nature, is larger than previously supposed. The genus *Habenaria* has recently been subdivided into several genera, and this subdivision has been a distinct advance in the taxonomy of orchids.

C. STUART GAGER,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A NEW TYPE OF ELECTRIC ORGAN IN AN AMERICAN TELEOST FISH ASTROSCOPUS.

JORDAN in his last book on fishes (1905) mentions that *Astroscopus* gives an electric shock, quoting Gilbert and others as his authorities. He also states that Professor Agassiz and others felt an electric shock from *Urophycis regius.* Dr. Gilbert, of Stanford University, kindly wrote me, in answer to inquiries, stating that he had felt electricity in *Astroscopus,* and that another collector had felt it in a Pacific specimen. These facts were mentioned in the bulletin of the National Museum.

I have examined *Urophycis* carefully and find no trace of electric organ, but have found that *Astroscopus* does possess a highly developed if small electric organ.

It consists of two masses of tissue, one lying behind each eye and extending as an approximately round column from the bare spot on the skin behind the eye down to the roof of the mouth. Like *Torpedo* it is composed of thin electric plates or 'electroplaxes' that lie in a horizontal position.

The electroplaxes do not occupy the full width of the column, but are much smaller and overlap and imbricate. Each one is a wide, thin syncytium, markedly different from any form yet described.

Its neuro-electric surface is smooth and has a thin structureless layer containing very few nuclei. Its other surface is raised into a close-set series of long, evaginated papillæ that